

IN THE SPECIFICATION

Instruction for amending the Specification, as required by 37 CFR §1.121(b) are provided below.

At page 1 please DELETE the PARAGRAPH beginning on line 14 with the words "The simplest method of preform fabrication " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 1 please DELETE the PARAGRAPH beginning on line 26 with the words "In order to practice the rod-in-tube ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 6 please DELETE the PARAGRAPH beginning on line 4 with the words "A further another object ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 6, please DELETE the PARAGRAPH beginning on line 7 with the words "Still another object of the invention ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 6, please DELETE the PARAGRAPH beginning at line 14 with the words "Yet another object of the invention ..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 13, please DELETE the PARAGRAPH beginning at line 24 with the words "With the present invention, the design " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 21, please DELETE the PARAGRAPH beginning at line 7 with the words "As shown in FIGURE 10..." and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 21, please DELETE the PARAGRAPH beginning at line 19 with the words "Finally, those skilled in the art " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 21, please DELETE the PARAGRAPH beginning at line 26 with the words "FIGURE 11 shows the next stage " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

At page 25, please DELETE the PARAGRAPH beginning at line 20 with the words "However, by simply collecting " and REPLACE that paragraph with the REPLACEMENT PARAGRAPH shown in the attached paper.

A separate SECTION is attached to this paper that includes pages entitled "Amendments to the SPECIFICATION", which indicate each of the individual changes made to each of the individual amended PARAGRAPHS, as required by 37 CFR §1.121(b).

AMENDMENTS TO THE SPECIFICATION

ON PAGE 1

AT LINE 14 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "The simplest method of preform fabrication " AND ENDING WITH THE WORDS "...replaced the rod-in-tube technique." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

The simplest method of preform fabrication is the so-called "rod-in-tube" method such as is disclosed and described in patent serial numbers 4,668,263 and 4,264,347. A rod of glass that will form the core of the fiber is inserted into a thick-walled tube that will become the cladding, and the two are fused together at high temperature. The relative dimensions of the core and cladding in the drawn fiber are identical to that of the original preform. The main advantage of the rod-in-tube technique is its simplicity and as such it was used almost exclusively during the earliest years of fiber development. However, while simple, this technique was also quite limited in its ability to implement optical fiber designs having any but the most rudimentary characteristics~~[, and n]~~Newer methods capable of producing ultra-low-loss fibers, such as are required for optical telecommunications, have essentially replaced the rod-in-tube technique.

ON PAGE 1 AND CONTINUING TO PAGE 2

AT LINE 26 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "In order to practice the rod-in-tube " AND ENDING ON PAGE 2 WITH THE WORDS "...most notably transition metals." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

In order to practice the rod-in-tube method, bulk glass is usually synthesized by mixing together the various ingredients in powder form and melting the mixture in a high-temperature furnace. All modern preform fabrication methods, however, are based instead on vapor-deposition techniques. The core and cladding materials are formed by reacting various gas-phase precursors at high temperature to form a glass "soot" that is subsequently sintered into a solid material. A principle advantage of the vapor-deposition process is its inherent capacity for providing a built-in purification step that immediately

precedes the synthesis step. Starting reagents (liquids or solids) are heated and delivered to a reaction zone as a vapor phase. This distillation-like process leaves behind the vast majority of contaminating species typically present as trace constituents in the starting reagent materials, most notably transition metals.

ON PAGE 6

AT LINE 4 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "A further another object " AND ENDING WITH THE WORDS "...central core region" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

A further ~~[another]~~ object of this invention is to provide a glass preform for use in fabricating a multimode optical fiber having a non-uniform dopant distribution within a central core region.

ON PAGE 6

AT LINE 7 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "Still another object of the invention " AND ENDING WITH THE WORDS "...forgoing characteristics" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

Still another object of the invention is to provide a glass preform for use in fabricating a polarization-maintaining optical fiber, and for providing such a fiber exhibiting any or all of the ~~[forgoing]~~foregoing characteristics

ON PAGE 6

AT LINE 14 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "Yet another object of the invention " AND ENDING WITH THE WORDS "...properties and characteristics." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

Yet another object of the invention is to provide a glass preform for fabricating optical fibers having any combination of the ~~[forgoing]~~foregoing properties and characteristics.

ON PAGE 13 AND CONTINUING TO PAGE 14

AT LINE 24 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "With the present invention, the design " AND ENDING ON PAGE 14 WITH THE WORDS "...to suit the requirements of the application.)" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

With the present invention, the design and fabrication of such customized preforms becomes realistic. FIGURE 7 shows a representative preform for a step-index fiber with a cladding-to-core diameter ratio of about 10:3 and wherein the rare-earth dopant is confined to a central region of the core having a diameter about one-half (1/2) that of the core region. (Typical, representative dimensions of these regions would be a 200 μm \varnothing cladding and a 60 μm \varnothing core region, comprising a 15 μm thick annular ring surrounding a 30 μm \varnothing central, rare-earth-doped core zone. Each of these dimensions may be varied, however, to suit the requirements of the application.)

ON PAGE 21

AT LINE 7 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "As shown in FIGURE 10, " AND ENDING WITH THE WORDS "...placed on its side before" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

As shown in FIGURE 10, a preform template 1004 delineates the core/cladding boundary, showing directly which cladding rods should be removed. ~~[Perform]~~Preform template 1004 can, of course, be modified to improve the ease with which the transfer of rods is accomplished. In particular, the "stepped" central portion of the template can be replaced with a removable plug 1005 that allows the user to partially displace the desired rods, as shown. Plug 1005 then would be removed, and the displaced volume in the ~~[perform]~~preform bundle would be "back-filled" through the hole left behind by the plug with new glass rods having the desired property (e.g., core rods). This procedure, therefore, prevents the cladding rods from inadvertently moving during the replacement process because the core region of the preform always contains substantially the same volume of glass rods as core rods 1003 are displaced. ~~[contained within tube 1004 would be placed on its side before]~~

ON PAGE 21

AT LINE 19 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "Finally, those skilled in the art " AND ENDING WITH THE WORDS "...to the finished perform" PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

Finally, those skilled in the art will appreciate that preform template **1004** can comprise any number of distinct regions, or plugs, having a variety of shapes, sizes, and locations (e.g., for the stress elements described in the context of PM fibers). This approach thus provides a simple method for assembling a preform bundle, with wide flexibility in the range and complexity of physical structures and chemical properties imparted to the finished ~~[perform]~~preform.

ON PAGE 21 AND CONTINUING TO PAGE 22

AT LINE 26 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "FIGURE 11 shows the next stage " AND ENDING ON PAGE 22 WITH THE WORDS "...an ampule **1200** as shown in FIGURE 12." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

FIGURE 11 shows the next stage of processing. Bundle **1000** is transferred into a second cladding tube **1100** in which it is suspended and immobilized between two plugs, e.g., of fiberglass wool **1105** (ultra-high purity silica, available commercially). Fiberglass packing **1105** prevents the bundle from sliding in cladding tube **1100** and ensures that there is no relative movement of rods within bundle **1000**. This second cladding tube **1100** is fabricated with an inner lip or waist **1101** (formed by partial collapse of the cladding tube under vacuum) to provide mechanical support of the above assembly. Because the fiberglass plug is porous, the entire assembly can be cleaned and dried in place, without any need to handle the bundle directly, thereby preventing contamination. The cleaning and drying steps would likely involve both liquid-phase and gas-phase processes[~~7~~] similar to those used with the MCVD method. The cleaned and dried assembly is then evacuated and the cladding tube sealed off at both ends to form an ampule **1200** as shown in FIGURE 12.

ON PAGE 25

AT LINE 20 OF THE SPECIFICATION, IN THE PARAGRAPH BEGINNING WITH THE WORDS "However, by simply collecting " AND ENDING WITH THE WORDS "...and the ampule would be sealed." PLEASE AMEND THE SPECIFICATION AS FOLLOWS:

However, by simply collecting the oxide soots of individual reactant species generated in separate reaction processes in the glass ampule *by weight*, it is far more likely that a final target glass composition can be achieved accurately and reproducibly. This result would be achieved by combusting a single reactant gas stream and determining the incremental weight gain of the ampule as the oxide soot collects on its interior walls until a target weight is achieved. The process would be repeated with each subsequent reactant specie until each had been combusted and the desired quantity of its oxide collected. The collected powders would be mixed (e.g. by tumbling them within the ampule), and the ampule would be sealed.